Syo KUROKAWA*: **Studies on Japanese species of *Xanthoparmelia* (Parmeliaceae) (1)**

黒川 道*: 日本産キクバゴケ属（ウメノキゴケ科）の検討 (1)

In the last decades, the lichen genus *Parmelia* s. lat. has been extensively studied and nearly 30 genera segregated from *Parmelia* s. str. have been proposed or resurrected by various authors (Hale 1974a, 1974b, 1974c, 1974d, 1976, 1984, 1985, 1986, 1988a, Esslinger 1978, Sipman 1980, 1986, Culberson & Culberson 1981, Krog 1982, Goward 1985, Elix, Johnston & Verdon 1986, Elix & Hale 1987, Lumbsch, Kothe & Elix 1988) Although ascocarp or pycnidial differences have been considered to be important features in segregating crustose lichen genera such as *Lecanora* s. lat. and *Lecidea* s. lat. (Eriksson 1981, Hafellner 1984, Hertel 1984, Eriksson & Hawksworth 1986), these are rather uniform within *Parmelia* s. lat. Thus a number of European workers have not yet accepted fully these new genera, since they do not consider that such generic splits have been justified by different apothecial structure, ascus structure or pycnidial characters. However, most of these genera seem to represent natural species groups at least with regard to their morphological, geographical, anatomical as well as chemical characters. In my previous publications, I was reluctant to accept these new genera. However, *Parmelia* s. lat is apparently an unnatural lichen group including species highly developed under symbiotic condition and can be considered to have fully differentiated into several species groups, some of which can be segregated at generic level. The genus *Xanthoparmelia* (Vain.) Hale seems to be well-defined one of them. It is characterized by the presence of predominantly simple rhizines, the lack of cilia and pseudocyphellae, and the production of usnic acid in the cortex. Species of the genus are mostly restricted to open habitats such as on rocks or on consolidated soils in arid, semi-arid, or other dry regions. Although *Xanthoparmelia*, on the other hand, is apparently closely related to the genus *Paraparmelia* Elix et Johnston and congeneric status of these two must be discussed in the future, *Xanthoparmelia* has priority over the latter.

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The species of *Xanthoparmelia* exibit considerable variability in morphology and chemistry. In the present work, the following characters are used for separating species. In brief, they are: 1) degree of adnation of the thalli, 2) lobe width and configulation, 3) colour of lower surface of lobes, 4) density of rhizines, 5) presence or absence of isidia, 6) shape and size of isidia, if present, 7) secondary products produced in the medulla.

Japanese species of *Xanthoparmelia* are exclusively saxicolous and none of terricolous species has been found. The colour of the lower surface of the lobes has been considered to be one of the most important characters segregating species. In fact, the colour varies pale ivory to jet black. For the purpose of this study, the colour of the lower surface is divided into three groups: pale ivory to brown or dark brown with darker or blackish brown narrow zone near the lobe apex; jet black with brown or dark brown narrow zone near the lobe apex; and brown to dark brown with blackish brown or difinite black zone near the center of thallus. The colour of the last group was reported for *Xanthoparmelia dichotoma* (Müll. Arg.) Hale (=*Parmelia dichotoma* Müll. Arg) by the author (Kurokawa 1969) and has been considered to be a consistent character separating the species from *X. furcata* (Müll Arg.) Hale (=*Parmelia furcata* Müll. Arg.) (Filson 1982, Elix, Johnston & Armstrong 1986).

While soredia are rare in *Xanthoparmelia* (Elix, Johnston & Armstrong 1986) and are known in none of Japanese species, isidia are found in number of species of the genus. Although density of isidia produced by a species may vary considerably, their shape and size seem to be almost invariably characteristic of the species. Consequently, in the present paper, the shape of isidia is described with care and the size of isidia is recorded for each species.

In the present work, all specimens were tested by thin layer chromatography using a mixture of *n*-hexane, ethyl ether, and formic acid (5:4:1) as a developing solvent. As mentioned above, all species contain usnic acid in the upper cortex. Although major secondary products contained in the medulla have proved to be of greater taxonomic value (Hale 1971, Kurokawa & Filson 1975, Kurokawa 1982, Filson 1982, Elix, Johnston & Armstrong 1986), some of minor products also seem to be taxonomically important, especially when presence or absence of them is correlated to morphological difference.

Specimens cited in this paper are preserved at TNS, unless otherwise stated. Sincere appreciation is expressed to Dr. H. Koyama of Department of Botany,

Kyoto University for the loan of type specimens.

Xanthoparmelia coreana (Gyeln.) Hale, Mycotaxon 33 : 402. 1988. (Fig. 1a)

Parmelia coreana Gyeln., Fedde Repert. **29** : 280. 1931. Type. Corea, in Palto, Faurie 4526—lectotype in BP and isotype in KYO.

Thallus adnate to loosely adnate, yellow-green, saxicolous; lobes sublinear-elongate, usually imbricate, 1–2.5 mm wide; upper surface dull or commonly shiny, often faintly white-maculate, isidiate, isidia mostly simple and subglobose, often pale gray tipped, barely erumpent, sometimes elongate and branched, branchlets constricted at the base; medulla white; lower surface pale brown, brown or chestnut-brown; rhizines sparse to moderate, simple, of the same colour as the lower surface or blackish brown, rather coarse. Thallus 220–270 μm thick; upper cortex 15–24 μm thick; algal layer continuous, 35–50 μm thick; medulla 130–180 μm thick; lower cortex hyaline, 17–25 μm thick. Apothecia rare, subsessible, 3–9 mm in diameter, disc flat to slightly concave, brown, margin thin, crenulate to deeply incised, amphithecium isidiate; hymenium 50–60 μm high; spores colourless, simple, 5×10–12 μm.

Fig. 1. *Xanthoparmelia coreana* (Gyeln.) Hale. a. thallus (×1). b. branched isidia (×28). c. simple globose isidia (×14).

Chemistry. Thallus K −; medulla K + yellow turning red, C −, KC −, P + intense yellow; containing usnic acid, salazinic acid (major), norstictic acid (minor) and consalazinic acid (minor).

Xanthoparmelia coreana is characterized by the pale to chestnut-brown lower surface, subglobose and barely opened isidia, and the production of salazinic acid as the major secondary product in the medulla. Although it had been considered to be conspecific with *X. mexicana* (Gyeln.) Hale, Hale (1988b) separated it from the latter species by the barely erumpent isidia, consistantly dark brown lower surface and faintly white-maculate surface. Lobes of *X. coreana* are sublinear-elongate and often imbricate, whereas they are subirregular and usually rounded at the apices in *X. mexicana*. Isidia are subglobose or almost globose in juvenile stages in both of these species. While simple subglobose isidia are less than 0 2 mm in diameter in *X. mexicana*, they are 0 2–0 3 mm in diameter in *X. coreana* (Fig. 1c). Well-developed and branched isidia of *X. coreana* (Fig. 1b) are 0.7–1.0 mm in height and 0.3–0.4 mm in diameter near the base, whereas they are about 0.6 mm in height and less than 0.3 mm in diameter even near the base in *X. mexicana* In addition, branchlets of isidia are also subglobose or distinctly constriced at the base in *X. coreana* (Fig. 1b).

White maculae on the upper surface are usually so faint and are often invisible, even though Hale (1988b) considered them as important features of this species.

When Asahina (1952) studied Japanese species of *Parmelia*, he recognized three varieties under *P. conspersa* (L) Ach.; var. *latior*, var. *isidiosula* and var. *hypoclysta*. Most specimens referred to var. *latior* and var. *isidiosula* by him are identified with the present species.

Distribution. This species is known from Japan, Korea and north-eastern China The northern-most locality in Japan known at present is Nikko in Kanto District. It is common on rocks along the coast to elevation about 1800 m in Japan, including the Bonin and Ryukyu Islands. Two specimens collected in nortn-eastern China (Chengte, Pref. Liaoning, S. Asahina s. n and Huantaohedzi, Prov. Mutankiang, S. Asahina s. n.) are identified with this species. Specimens examined are 56

Exsiccata examined. S. Kurokawa, Lich. Rar. Crit. Exs., no. 235 (sub *Parmelia mexicana* Gyeln.) (TNS).

Xanthoparmelia orientalis Kurok., sp. nov. (Fig. 2)

Quoad habitum ad *Xanthoparmeliam coreanam* accedit, sed ab ea differt thallo subtus nigrescenti versus centrum et isidiis saepe cylindricis et coralloi dibus.

Thallus adnate to loosely adnate, yellow-green, saxicolous; lobes subirregular to sublinear, often imbricate, 1.0–2.5 mm wide; upper surface dull, sometimes faintly white-maculate, blackish brown or black margined near lobe apices, isidiate, isidia subglobose to cylindrical and later often coralloid-branched; medulla white; lower surface brown or blackish brown in rather broad zone near lobe apices and black in older lobes; rhizines rather sparse, simple, coarse, of the same colour as the lower snrface, 0.1–0.7 mm long Thallus 170–240 μm thick; upper cortex about 20 μm thick; gonidial layer continuous, 30–38 μm thick; medullary layer 110–170 μm thick; lower cortex hyaline but blackish brown in the outer one third, about 25 μm thick Apothecia rare, adnate, 2–7 mm in diameter, disc chestnut-brown, more or less concave, margin crenate, amphithecium isidiate; hymenium 45–60 μm high; spores colourless, simple, 5×10–11 μm. Pycnidia not seen.

Chemistry. Thallus K −; medulla K + yellow turning red, C −, KC −, P + intense yellow; containing usnic acid, salazinic acid (major), norstictic acid (minor or trace), and consalazinic acid (minor).

Type Japan. Prov. Aki: Miyajima Island, S. Kurokawa 64403—holotype in TNS

Fig. 2. Holotype of *Xanthoparmelia orientalis* Kurok. (×1.3).

This new species is characterized by having subglobose to cylindrical isidia and a blackish brown to black lower surface with rather broad brown to dark brown zone towards the lobe apices and by producing salazinic acid along with minor amounts of norstictic and consalazinic acids. It has been reported as *Parmelia tinctina* Mah. et Gill. [=*Xanthoparmelia tinctina* (Mah. et Gill.) Hale] in Japan (Yoshimura 1974). However, isidia of the present species are subglobose or cylindrical even in juvenile stages and become coralloid-branched at maturity (Fig. 3a, b), whereas they are exclusively subglobose or globose in *Xanthoparmelia tinctina* (Fig. 3c). In addition, the lower surface is jet black, excepting very narrow zone near the lobe apices, in *X. tinctina*, while it is brown to dark brown in broad zone towards lobe apices with blackish brown or black zone near the center of the thallus in *X. orientalis*.

In Japan, this new species may be confused with *X. coreana*, because these two species have isidia and produce salazinic, norstictic and consalazinic acids in common. However, it is easily distinguished from the latter by the colour of lower surface. Isidia of *X. orientalis*, on the other hand, are subglobose to cylindrical even in juvenile stages, becoming coralloid-branched The simple isidia are 0.1–0.2 mm in diameter and often 0.3–0 4 mm in height and branched isidia are 0.15–0.3 mm in diameter and 0.6–1.0 mm in height. As a rule, isidia are a little thinner than those of *X coreana*. When they are branched, in addition, branchlets are not constricted at the base in *X. orientalis*.

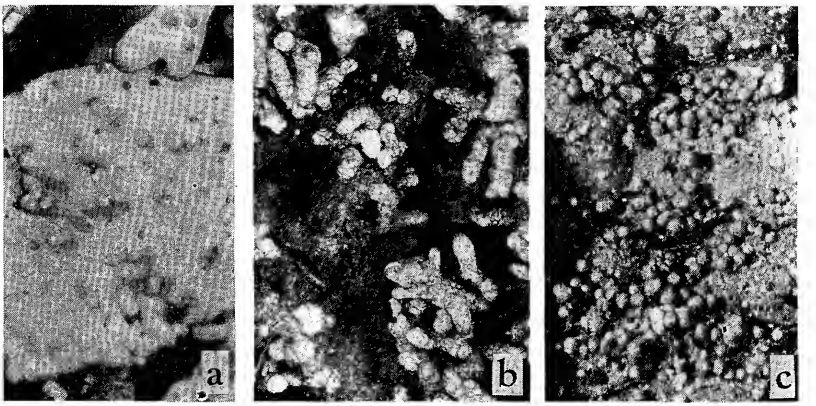

Fig. 3. Isidia of *Xanthoparmelia orientalis* Kurok. and *X. tinctina* (Mah. et Gill.) Hale (×14). a. simple isidia of *X. orientalis*. b. branched isidia of *X. orientalis*. c. globose isidia of *X. tinctina*.

Distribution. *X. orientalis* seems to be a low-land species known from eastern to western Japan and Taiwan. It has not been collected in higher altitudes than 1300 m.

Specimens examined. Japan. Prov. Musashi: Mt. Myohogatake, Mitsumine, Chichibu, elevation about 1300 m, S. Kurokawa 56139; Shiroku, Arakawa-mura, Chichibu, elevation about 400 m, S. Kurokawa 56104; Mt. Takao, Y. Asahina s. n. Prov. Izu: Mt Buzan, Shimoda, S. Kurokawa 58623 & 58626. Prov. Mikawa: Mt. Horaiji, Minamishitara-gun, elevation about 600 m, H. Kashiwadani 9918. Prov. Kii: Nameradani, Kuki, S. Kurokawa 59024; Cape Shionomisaki, Nishimuro-gun, on rocks along the coast, S. Kurokawa 71029; Kotonotaki Water Fall, Susami cho, Nishimuro-gun, elevation about 250 m, H. Kashiwadani 14623. Prov. Harima: Mikawa-mura, Shiso-gun, K. Utsumi s. n. Prov. Izumo: Izumo Shrine, Izumo City, elevation about 5 m, H. Kashiwadani 8770; Ui, Mihogaseki-cho, Yatsuka-gun, elevation about 5 m, H. Kashiwadani 8787. Prov. Iwami: Mt. Sanbe, Ohda City, elevation 520 m, H Kashiwadani 5595. Prov. Bizen: Gokenya, Fukukara-cho, Wake-gun, M. Togashi s. n. Prov. Aki: Mt. Ohmine, Saiki-gun, elevation 440 m, H. Kashiwadani 31 & 34; Tsujurahara, Yuki-cho, Saiki-gun, elevation about 400 m, H. Kashiwadani 7421 & 7424; Nogaihara, Saiki-gun, elevation about 700 m, H. Kashiwadani 1540; Miyajima Island, elevation about 40 m, H. Kashiwadani 5633. Prov. Iyo: Ohira, Oda-machi, Kamiukena-gun, elevation about 50 m, S. Kurokawa 72255. Prov. Tosa: Matsubara, Yuzuhara-cho, Takaoka-gun, elevation about 250 m, H. Kashiwadani 19776. Prov. Tsushima: Mt. Shiratake, Shimoagata-gun, H. Koyama s. n. Prov. Higo: Tomoesaki, Tomioka, Amakusa-gun, Y. Asahina & M. Togashi s. n.; Hitoyoshi, M. Togashi s. n. Prov. Ohsumi: Onoaida, Kumage-gun, elevation 50 m, H. Kashiwadani 7305; Mt. Motchomu, Yakushima Island, elevation 300 m, H. Kashiwadani 15626. Ryukyu Islands: Izena Island, S. Kurokawa 73122 & 73125. Taiwan. En route from Keelung to Tamsui, S. Kurokawa 1279-a.

Xanthoparmelia togashii Kurok., sp. nov. (Fig. 4)

Xanthoparmeliae tinctinae primo adspectu maxime similis, sed superficie inferiore pallido brunnescenti et acidum gyrophoricum una cum acidum usnicum, acidum, salazinicum, acidum norsticticum et acidum consalazinicum continenti differt.

Thallus foliose, adnate on rocks, pale yellow-green, 4-9 cm in diameter; lobes sublinear-elongate to subirregular, contiguous or slightly imbricate, 1.5-3 mm

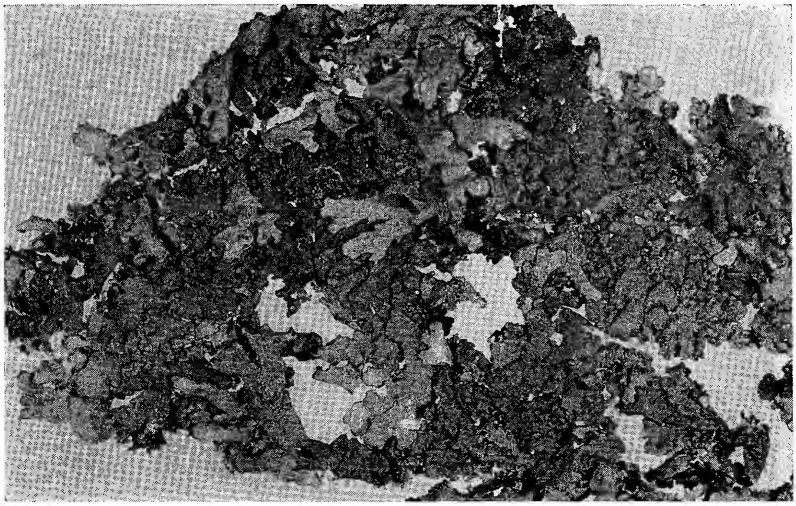

Fig. 4. Part of holotype of ***Xanthoparmelia togashii*** Kurok. (×1.6).

wide; upper surface flat, shiny, emaculate, sometimes faintly black-margined, isidiate, isidia short and subglobose, rarely forming smaller subglobose branchlets; medulla white; lower surface pale brown, sparsely rhizinate; rhizines simple, of the same colour as the lower surface, less than 0.3 mm long. Thallus 145–170 μm thick; upper cortex 12–16 μm thick; gonidial layer subcontinuous, 16–30 μm thick; medullary layer 95–120 μm thick; lower cortex subhyaline, ca 12 μm thick Apothecia and pycnidia not seen.

Chemistry. Thallus K −; medulla K + yellow turning red, C −, KC −, P + intense yellow; containing usnic acid, salazinic acid (major), gyrophoric acid (minor), norstictic acid (minor or trace) and consalazinic acid (minor).

Type. Japan. Prov. Kai: en route between Kuonji Temple and Sankohdo, Mt. Minobu, M. Togashi s. n.—holotype in TNS.

This new species resembles *X. tinctina*, since these two species have adnate thalli and similar subglobose isidia and produce usnic, salazinic, norstictic and consalazinic acids in common. However, it is clearly distinguished from *X. tinctina* by the pale brown lower snrface of the thallus. Subglobose isidia of *X. togahsii* (0 2-0.3 mm in diameter), in addition, are a little larger than those of *X. tinctina* (0 1-0.2 mm in diameter).

In Japan, on the other hand, this species may be confused with *X. coreana*, because they both have subglobose isidia of similar size and produce salazinic acid as the major secondary substance However, it can be clearly distinguished from the latter species by the production of gyrophoric acid, which is one of rare substances in the genus *Xanthoparmelia*. The thallus of *X. togashii* is more closely adnate than that of *X coreana*.

Distribution. This species is known only from the type locality in central Japan at present.

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広義のウメノキゴケ属を約30属に細分する考えもあるが，菌類としての形態的特徴を重くみるヨーロッパの学者には異論があるようである。しかし，これらの細分された属のなかには，共生する地衣として分化し，属としてまとまりのあるグループも認められる。*Xanthoparmelia*（キクバゴケ属　新称）もその1つである。本報告では，日本産キクバゴケ属地衣を検討した結果を順次報告することにする。

X. coreana（ヤマキクバゴケ 新称）は日光以西の日本と朝鮮，中国東北部に分布し，関東以西では本属中で最も普通の種である。やや球状の裂芽をつけ，地衣体の裏面は淡褐色ないし褐色である。吉村（1974）は本種をメキシコキクバゴケ（*Parmelia*

mexicana) としたが，主として裂芽の形や大きさで区別される。

X. orientalis (アカゾメキクバゴケ) はヤマキクバゴケに似ているが，裏面の色が暗褐色で，とくに地衣体中央部附近で黒色になる点で異なる。吉村 (1974) は，本種をヨーロッパ産の *Parmelia tinctina* と同一とみなして，和名をアカゾメキクバゴケとしたが，ここではその和名を踏襲することにした。

X. togashii (ミノブキクバゴケ 新称) はヤマキクバゴケに似ているが，キクバゴケ属には珍らしいジロフォール酸を含む点で別種と考えられる。学名は採集者，富樫誠氏を記念したものである。

□松田義徳：**秋田県平鹿地方植物誌** 118pp. 1988. 秋田県立横手域南高等学校. 平鹿地方は秋田県の最内陸部を占め平鹿町を中心とする町村からなり，40-80 m alt. の水田地帯，200-400 m の丘陸地，一部は 1000 m にせまり，これを僅かに超える山々がある。雄物川がその西縁を限り，東側の一部は岩手県境に接する。平凡と云えば平凡なこの地域を丁寧に調査した報告書で村松氏の秋田県植物誌 (1932) 以後の県内の植物の文献のほかに，大井 (1983)，中池 (1982) などが参照され，誠実にまとめられている。シダ (64種)，裸子 (9)，単子葉 (259)，双子葉 (601) が学名・産地つきでまとめられている。自然ブナ林，ケヤキ林はわずかに残存し，カスミザクラ，コナラ，ヒメヤシャブシ (急峻地)，タニウツギ (同前) ユキツバキ (林床) が目立つ。村落にはリンゴ，ブドウが多い由。 (津山 尚)

□高知県立牧野植物園 (編)：**植物目録** 82pp. 1988. この植物園は1958年に牧野富太郎博士を記念して設立され，野生植物の栽植も特徴の一つになっている。大いに充実してきた1988年現在同園に栽培されている植物 (温室を除く) の目録である。産地も明記されている。なお同園の所在は 〒780 高知市[redacted]。 (伊藤 洋)

□植物研究グループ飯泉ゼミ (編)：**檜原の植物** 246 pp. 1989. 織水社. ¥1,950 (税込). 東京都西多摩郡檜原 (ひのはら) 村は，五日市町から奥へ入った多摩川の支流秋川の流域を占める山と谷の村で，西端にある三頭 (みとう) 山 1528 m にはブナの原生林などもある。飯泉[redacted]氏が主宰する上記の会には植物好きが集まっていて，その方々が10年間に村内の各地を歩いた記録をまとめたものである。初めにウラジロヒカゲツツジなど94点の美しいカラー写真，巻末に檜原村産高等植物目録として1124種のリストがあり，分布資料として大いに役に立つ。記事は多彩で注目すべき植物，各地区の植物，山道の案内と季節ごとの植物，植物相とその保護，その他民俗なども載っていておもしろい。発行所の宛て先は 〒192 八王子市[redacted]。 (伊藤 洋)